SECTION 10.0

Engineering

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In accordance with CEC regulations, this section, together with the Engineering appendices and Sections 6.0 and 7.0 (Gas Supply and Water Supply, respectively), presents information concerning the design and engineering of the CVEC. Section 10.1 describes the design of the facility with reference to Section 2.0, the Project Description. Section 10.2 discusses the reliability of the CVEC. Section 10.3 presents the estimated thermal efficiency of the facility. Section 10.4 describes the LORS applicable to the engineering of the CVEC and identifies agencies that have jurisdiction and the contact persons within those agencies.

10.1 Facility Design

A detailed description of the CVEC project is provided in Section 2.2, Generating Facility Description, Design, and Operation. Design for safety is provided in Section 2.3, Facility Safety Design.

A geotechnical assessment of the proposed site has not been performed, but is scheduled to be performed during the fourth calendar quarter of 2001. The full report will be provided in 10 copies to the CEC when it becomes available.

Summary descriptions of the design criteria are included in the following appendices:

- Appendix 10A, Civil Engineering Design Criteria
- Appendix 10B, Structural Engineering Design Criteria
- Appendix 10C, Mechanical Engineering Design Criteria
- Appendix 10D, Electrical Engineering Design Criteria
- Appendix 10E, Control Engineering Design Criteria
- Appendix 10F, Chemical Engineering Design Criteria

Design and engineering information and data for the following systems are found in the following sections of the AFC:

- **Power Generation** - See Section 2.2.4, Combustion Turbine Generators, Heat Recovery Steam Generators, Steam Turbine Generator and Condenser, and Auxiliary Boiler. Also see Appendix 10C and Sections 2.2.5 through 2.2.9, which describe the various plant auxiliaries.
- **Heat Dissipation** - See Section 2.2.8, Plant Cooling Systems, and Appendix 10C.
- **Cooling Water Supply System** - See Section 2.2.7, Water Supply and Use; Section 2.2.7.4.1, Water for the Circulating Water System; Sections 2.2.7.4.2 – 2.2.7.4.4, which describe other water systems, and Appendix 10F.
- **Air Emission Control System** - See Section 2.2.11, Emission Control and Monitoring, and Section 8.1, Air Quality.
- **Waste Disposal System** - See Section 2.2.9 and Section 8.13, Waste Management.
- **Noise Abatement System** -See Section 8.5, Noise.

- **Switchyards/Transformer Systems** -See Section 2.2.5, Major Electrical Equipment and Systems; Section 2.2.13.2 Grounding; Section 2.2.5.1, AC Power-Transmission; Section 2.2.14, Interconnect to Electrical Grid; Section 5.0, Electric Transmission; and Appendix 10D.

10.2 Facility Reliability

This section discusses the availability of fuel, and the expected service life of the plant and the degree of reliability to be achieved by the CVEC.

10.2.1 Fuel Availability

Natural gas will be purchased from numerous gas suppliers and delivered to the CVEC by PG&E. PG&E is the major transporter of natural gas in northern California, delivering gas from both Canada and the southwest United States to customers on its system. Purchases of natural gas may be aggregated into a common portfolio and delivered on PG&E's transmission system to a delivery point at the interconnection of PG&E's transmission system and the physical supply line to the CVEC. The supply line will commence at PG&E's Line 2 located 1.4 miles west of the CVEC and terminate at the CVEC (see Section 6.0). PG&E's Line 2 is a major, high-pressure backbone transmission line capable of delivering the required quantity of gas to the CVEC. It is conceivable that PG&E's line or the line from the PG&E interconnect point to the CVEC could become temporarily inoperable due to a breach in the lines or from other causes, resulting in fuel being unavailable at the CVEC. The CVEC has no backup supply of natural gas and would, therefore, have to be shut down until the situation was corrected.

10.2.2 Plant Availability

The CVEC will be a merchant facility; it will operate as dictated by contractual power supply obligations and the relative cost of power generation from the facility. Due to the relatively high efficiency of the CVEC, it is anticipated that for normal operations, the facility will operate at high average annual capacity. The CVEC will be designed to operate between approximately 25 and 100 percent of baseload to support dispatch service. The CVEC will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The CVEC combined-cycle power block will consist of three natural-gas-fired CTGs, three HRSGs with natural-gas-fired duct burners, and one STG (three-on-one combined-cycle configuration). Secondary process steam demands will be provided by the combined-cycle steam or by a gas-fired auxiliary boiler. An emergency generator will support essential facility services when utility power is not available.

The combined-cycle power block is projected to operate between 50 and 100 percent of the time during each of the 30 years. The HRSG duct burners are projected to operate up to 58 percent of the time during each of the 30 years. The percent of time that the combined-cycle power block and the HRSG duct burners are projected to operate is defined as the "service factor." The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the combined-cycle power block and the HRSG duct burners, which considers projected percentage of time of operation, differs from the "equivalent availability factor" (EAF), which considers the projected percentage of energy production capacity achievable. EAF is defined as a weighted average of the percentage of full energy production capacity achievable. The projected EAF for the CVEC is estimated to be in the range of 92 to 98 percent. EAF differs from

the "availability of a unit," which is the percentage of time that a unit is available for operation, whether at full load, partial load, or standby.

Cooling tower and process makeup for the CVEC will be reclaimed water from the Fresno-Clovis WWTF. Potable water will be supplied from the existing City of San Joaquin municipal water system. Process makeup water will be treated as necessary at the CVEC site prior to use.

Waste disposal consists of the nonhazardous solids produced from the Zero Liquid Discharge Treatment System. Sanitary sewer wastes will be discharged to the existing City of San Joaquin sanitary system. Solid waste will be collected by the local non-hazardous waste collector. Most hazardous wastes will be collected and recycled by permitted recycling firms, and non-recyclable hazardous wastes will be collected by a licensed hazardous waste hauler and deposited in a hazardous waste landfill. For detailed information on the use of hazardous materials and management of wastes, see Sections 8.12 and 8.13.

There are no known geologic hazards other than the remote possibility of a major earthquake (see Section 8.15).

Special design features are included in the CVEC design to ensure power plant reliability, including redundancy of critical components (see Section 2.4.2, Redundancy of Critical Components).

Deterioration of output capacity and efficiency of the CVEC over time, called degradation, is expected to be on the order of 2 to 3 percent over a 3-year period. Cleaning, maintenance, or overhaul will recapture most of the loss. Over the expected 30-year life of the facility, the estimated total, nonrecovered loss in output and efficiency will be on the order of 1 to 2 percent.

10.3 Thermal Efficiency

The maximum thermal efficiency that can be expected from a large natural-gas-fired combined-cycle plant is approximately 55 to 57 percent. This level of efficiency is achieved when a facility is base-loaded. Other types of operations, particularly those at less than full gas turbine output, will result in lower efficiencies. The basis of CVEC operations will be primarily (1) the current prevailing market rate for spot power, and (2) pre-established contractual obligations to provide electricity to customers. Potential operating scenarios for the plant vary from a very low facility capacity factor to an essentially baseload plant. The number of plant startup and shutdown cycles is expected to range between zero and 300 per year per CTG. The number of hot startups versus cold startups cannot be predicted at this time.

Plant fuel consumption will depend on the operating profile of the power plant. It is estimated that the range of fuel consumed by the power plant will be from a minimum of near zero British thermal units (Btu) per year to a maximum at baseload.

Normal offline fuel consumption is 50 to 120 million Btu/hr.

The net electrical production of the CVEC cannot be accurately forecast at the present time given the merchant nature of the plant. The maximum annual generation possible from the facility is estimated to be between 7,125 and 7,655 gigawatt hours (GWh) per year. The amount of startup and shutdown power generation can also only be estimated. The range of possible startup/shutdown generation begins near zero MWh per year and increases to a maximum of 140 to 220 GWh per year.

The number of hours that the CVEC will be operated at a variety of logical load points will depend ultimately on power market conditions.

10.4 Laws, Ordinances, Regulations, and Standards (LORS)

10.4.1 General LORS

The following LORS are generally applicable to the project:

- Uniform Fire Code, Article 80
- Occupational Safety and Health Act – 29 CFR 1910 and 29 CFR 1926
- Environmental Protection Agency – 40 CFR 60, 40 CFR 75, 40 CFR 112, 40 CFR 302, 40 CFR 423, 40 CFR 50, 40 CFR 100, 40 CFR 260, 40 CFR 300, and 40 CFR 400
- California Code of Regulations – Title 8, Sections 450 and 750 and Title 24, 1995, Titles 14, 17, 19, 20, 22, 23, and 26
- California Department of Transportation – Standard Specifications
- California Occupational Safety and Health Administration – Regulations and Standards
- California Business and Professions Code – Sections 6704, 6730, and 6736
- California Vehicle Code – Section 35780
- California Labor Code – Section 6500
- Federal Aviation Agency – Obstruction Marking and Lighting AC No. 70/7460-1H
- Fresno County – Regulations and Ordinances
- City of San Joaquin – Regulations and Ordinances

Codes and standards pertinent to the generating facility are presented in Engineering Appendices 10A through 10F. The applicable local LORS and local agency contacts involved in administration and enforcement are described below.

10.4.2 Local LORS

CVEC site zoning is consistent with the development of a generating facility (see Section 8.4, Land Use).

The CVEC site is located within the city limits of the City of San Joaquin, in an area zoned for industrial use, and will therefore be subject to all applicable regulations of the City of San Joaquin.

10.5 Local Agency Contacts

Table 10.5-1 lists local agency contacts.

TABLE 10.5-1
Local Agency Contacts

Agency	Contact	Title	Telephone
Fresno County Fire Department	Cary Williams FCFPD Station No. 95	Captain	559-698-5500
City of San Joaquin	Shahid Hami	City Manager	559-693-4311
Fresno County Environmental Health Department	Harry Yee	Hazardous Materials Specialist	559-445-3271

10.6 Local Permits Required and Permit Schedule

After the receipt of the approval of project design, several permits will be required. These include a Building Permit, a Grading Permit, and a Certificate of Occupancy. These three permits are described in the City of San Joaquin's Municipal Ordinance.